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AUTHOR McGraw, Walter
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ABSTRACT

This report points out that the communications satellite appears to be on its way to becoming one of the most dominant and controlling technologies of our time, and this requires that a new evaluation be made of our entire communications process. The first section of the report discusses many aspects of the history of satellites, including the development of Telstar 1 and synchronous satellites, the organization of such telecommunications networks as COMSAT and INTELSAT, and the growth of domestic satellite systems that serve the nation's private commercial interests. Recently, a grass-roots movement has begun to grow, as people begin to realize that the communications satellite would not be possible without the initial and continuing investment of their tax dollars, that citizens must learn about satellites and must make decisions about them, and that people must act now if telecommunications access is to be made available to the nonprofit sector of society. The second section of the report discusses the Public Interest Satellite Association, formed to help the nonprofit sector obtain the benefits of satellite telecommunications and to assure that public policy options remain open for achievement of this goal. (GW)

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TOWARD THE PUBLIC DIVIDEND: A REPORT ON SATELLITE TELECOMMUNICATIONS AND THE PUBLIC INTEREST SATELLITE ASSOCIATION

By Walter McGraw

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An Interim Report Commissioned by
The Public Interest Satellite Association
55 West 44th Street, New York, N.Y. 10036
212-730-5172

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PREFACE

Remember, from the sixties, the famous line: "What if they held a war and nobody came?"

Here is a reality for the seventies: "They *are* holding a revolution and if we do not act quickly, we will miss it."

Over the past half century we have seen what has been called the "communications explosion." Today we know, as never before in history, that communications is power. It is power to sell: detergents, candidates, ideas and, indeed, complete life styles. It is power to steal: TV steals time from our young; common carriers, our money with rate structures even the government admits it cannot regulate; telecommunications in general, our volition for independent thinking. Finally, and most importantly, it is power to control: He who controls the means of communications, controls information. He who controls information, controls thought. He who controls thought, controls man.

The telegraph, telephone, radio and television all came into being with no real public or legislative thought; no planning; no consideration for the future shocks they might produce. But now, literally from out of the skies, has come a new technology: the communications satellite — a space age wonder which is much more than merely a new, more sophisticated piece of electronic hardware. The communications satellite is on its way to becoming, perhaps, one of the most dominant and controlling technology of our time. Satellite technology can integrate all known forms of intelligence transfer within a single centralized compartment of electronic devices. It appears destined to become all encompassing in its social impact. It requires that a whole new evaluation be made of our entire communications process. That re-evaluation is going on at this moment.

Basic to it are two points. One has to do with education. Satellite technology is so complex that only trained engineers and scientists understand the jargon about "flux density, footprints, and transponders." However, the principle involved is not scientific but political, economic and legal. Satellites are too important to be left solely to technologists. They must be acted on by the voters and their legislators. Citizens must learn about satellites; understand

them; make decisions about them. The public must become informed so it can become a concerned public.

The second area of importance has to do with money. The rationale for the billions of tax dollars spent on the space program was that there would be a "public dividend." But if current trends prevail, satellites are likely to follow the path carved out by the owners and managers of earlier communications hardware. Fortunately, however, to achieve this, new laws must be passed.

We view this as an opportunity to see that, for the first time, meaningful communications laws are forthcoming. But we must act quickly if we are to be heard where policy is made; if we are to make certain that telecommunications access is to be available to those who are not "members of the club." We must act now if our modern system of communications is going to be open to educators, to minority and community groups, to the nonprofit sector of society, and (let us be blunt about it) to us: you and me.

Whether we go or not, the communications revolution is happening. We plan to attend; we plan to be heard; the Public Interest Satellite Association plans to help make this a revolution in the public interest.

Contained within these pages is the story of why we think this is a period that could be called, with no exaggeration, a turning point in history.

March 1977 A.H./B.C.

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PROMISE AND PERFORMANCE

This is the age of the communications miracle. Never in history have so many of us been in so much contact with so many others over so much space. As a result, of course, never have the peoples of the world understood and interacted with each other so well. Hence, there is peace, prosperity and understanding throughout the homes and the nations of the world.

We leave to you the one word expletive you choose as suitable to describe the above.

But that *was* the promise. With the coming of the telegraph, the telephone, the wireless, television, solid state electronics, computers and, finally, satellites, that was the promise. Where did it go?

One answer might be found in the difference to be noted between the dream and the reality of "communicating." The dream: interaction, conversation, give and take, action-reaction — reaction-action. The reality: more people talking, not with but *at* more people than ever before. What was meant to be ebb and flow is, instead, a flood sweeping all before it to the base of a sky-high tower in Babel.

As with so many other twentieth century miracles, science fiction writers first gave form to the vision of an almost universal, inexpensive, instant system of intercommunications eventually reaching around the world. In each home, they predicted, there would be a center that would combine the services now provided by the postal service, the telephone, radio, television, telex and computer terminals. Information would flow both in and out of the system making possible, among other things, instant polling, distant business negotiations and rampant educational opportunities. Politically, a democracy with the best elements of that of ancient Athens was seen to stretch from the proverbial "rock ribbed coast" to "the sunny shores." Economically, time and distance would cease to be inhibitors. "Don't commute, communicate," said science-fictionist Arthur C. Clarke.

With dreams can come nightmares. By 1984 (to pick a random year), we could see this same technology held captive by an industrial-military-political complex which could take over a nation and keep power by controlling the uses to which that technology was put. Brainwashing, spying and enslaving the individual could be accomplished at the same time as worldwide aggression was being waged with remote controlled nuclear weapons from outer space. As firm believers in Murphy's First Law (If anything can go wrong, it will), most sci-fi writers have seemed to opt for the nightmare coming to pass rather than the dream.

And maybe they will be right.

A HISTORY OF SATELLITES

The Technology

Today all the technology needed for either the dream or the nightmare is in either commercial or experimental use. History tells us the chances are that there will be improvements; science, that chances are those improvements will be mere refinements. The necessary "breakthroughs" have been with us for three decades. Solid state electronics came out of the Bell Laboratories in 1948; the first electronic computer out of the University of Pennsylvania in 1946; the Aggregate 4 out of Peenemünde, Germany, in 1942. The A-4, better known as the V-2 which Hitler loosed onto Britain, has been called "perhaps the greatest leap forward in technology that has ever been made up to that time." (Clarke.) Achieving a velocity of Mach 5, it was the first rocket efficient enough to put a payload into space. No rocket in use today is more than a refined V-2.

The first sounds to be heard from a satellite put into orbit by a rocket came in 1957 from a Russian refined V-2, called Sputnik. It beeped. The U. S. National Aeronautics and Space Administration launched its first communications satellite, Echo I, in 1960. It was used to bounce radio waves around the world. Soon the U. S. Army launched Courier I with tape recorders which could both receive and broadcast messages. Two years later NASA and the Bell Labs cooperated to make possible both a live telephone call and a live TV picture brought "via satellite."

Telstar

Telstar I, paid for by AT&T, both literally and figuratively, "put it all together." Until 1956, a trans-Atlantic telephone call depended on radio which worked only when atmospheric conditions allowed. At the cost of millions of dollars, a trans-Atlantic telephone cable was laid. It could handle 36 calls at one time. Telstar, now considered a primitive first step, could handle nearly one thousand calls at one time. And, just as the trans-Atlantic telegraph cable, in use since just after the Civil War, could not be used for telephone calls, the telephone cable could not transmit television. A two- to three-thousand mile long coaxial cable, even if it worked, would have been enormously expensive. Trans-Atlantic TV microwave transmission would have required the permanent services of over one hundred relay ships. Telstar, less than three feet in diameter, did the job by itself.

But there were drawbacks to Telstar. Its orbit was elliptical and low. This meant that TV signals, which travel in straight lines, could be sent from point A to point B only during the comparatively short periods when the satellite was in direct "line of sight" from both

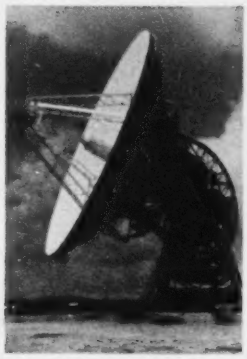
points. When Telstar sped out of "sight" of either point, transmission had to be delayed until it was back in place after making a complete circuit of the globe. Of course continuous transmission could have been achieved by having a parade of Telstars so that one would have been within direct "sight" of both points at all times but this would have required some thirty satellites and, fortunately, there was a better solution.

Synchronous Satellites

In 1945, Clarke, who is also an engineer, proposed a solution that was deceptively simple. A satellite, traveling at a speed of 6875 miles per hour, placed in orbit 22,300 miles above the earth would take almost 24 hours to circle the globe. As you may have noticed, it takes the earth almost 24 hours to turn on its axis. The result: it would be geosychronous; from the earth the satellite would seem to stand still and thus remain in "line of sight" at all times. The height furnished still another advantage: the satellite would be in "the line of sight" of so many points on earth that only three satellites, strategically placed, could give the world a global intercommunications system. In 1963 SYNCOM, the first *syn*chronous *com*munications satellite, was launched.

Since then, literally thousands of satellites later, the technological refinements have come so fast that probably only the Pentagon has been able to keep any track of them. More powerful rockets capable of launching ever larger payloads have been designed. Nuclear engines may shortly be in use. Nuclear power is already being used to supplement solar in providing satellites with a continuing source of lavish energy. Sputnik's beep can now be amplified to a roar heard around the world. On-board computers have shrunk in size as their capacities have grown. Satellites are talking to each other and making some of their own decisions. Solid state electronics has made it theoretically possible for a single satellite to carry a virtually unlimited number of telephone conversations at once. However, the two most recent DOMSATs, or domestic satellites, to take flight are designed to handle 14,400 simultaneous telephone conversations each. Or, if we prefer, each of them can relay up to 24 color TV programs at one time.

Satellite earth station now in commercial use. Size: about ninety feet in diameter. Cost: up to five million dollars.



On the ground, too, there have been changes. As the more powerful rockets throw into orbit satellites with stronger but lighter receivers, amplifiers and transmitters, the needs of earth stations have become less complex and costly. Originally antennas 30 to 97 feet in diameter were needed to service terminals costing from hundreds of thousands to millions of dollars.

Now in use are earth stations with antennas 3 to 10 feet in diameter

handling telephone, telex, facsimile, data, radio and television communications. Cost: $10,000 to $15,000. The Japanese have a prototype TV satellite receiver which now costs about $1,500. Mass produced it could sell for perhaps around one-tenth that amount. The day when every home can be a comsat earth station is here, at least as far as the technology is concerned. With the application of what is already known, the science-fiction writers' global intercommunications system (GIS) could be as real and practical as Clarke's 22,300-mile solution has been since 1963.

Receive-only TV terminal experimented with by NASA in 1974. Size: ten feet in diameter. Cost: about ten thousand dollars.

It's All Here

The ramifications of GIS stagger even the seemingly unlimited imagination of Clarke. Warning that most probably the human mind could not even stumble on what might be the most far reaching results of such a system, he has suggested a few of the changes he sees as most likely to be forthcoming. An almost unlimited choice of TV and radio fare is obvious. You do not want to wait for Public Television to bring you *Upstairs, Downstairs?* Watch its original broadcast on the BBC via satellite direct to your own TV receiver. In Paris, Arkansas, you can have daily home delivery, within minutes of the time it is published, of the *Paris Soir*, via satellite. The *Wall Street Journal* is already sending out full pages to various printing plants around the world via satellite. Unhappy with what is laughingly called the U.S. Postal *Service*? Forget it. Send what letters you still write, along with copies of any needed documents, via satellite. Talking will replace much writing when you can have intercity, interstate and international conferences without leaving your home. And distance will not affect the cost. How does a Topeka-Tokyo call for a dime grab you? Since all calls would be traveling the same distance up and down, there would be no long distance calls. Clarke, in fact, sees this as the ultimate solution to the energy crunch. More people than not in the executive and professional levels could conduct their business without ever leaving home. To repeat: "Don't commute, communicate."

The Japanese plan to test this extremely small satellite receiver in 1978. Size: three feet in diameter. Cost: about fifteen hundred dollars.

However, all of the above may not be considered with unbridled enthusiasm by everyone. The right of privacy, for instance, will become even harder to protect, but hopefully our handy home receivers will at least be equipped with the greatest invention since the wheel: the off-switch. Of more immediate economic importance, telephone long-lines would be made as obsolete by domestic satellites as some maintain the trans-Atlantic cables were made by Telstar. The radio and TV networks would lose their *raison d'etre*. The postal unions could be counted on for some unfavorable

comment. And your friendly local politician might not be all that happy to receive your instantaneous reaction to his having voted himself another pay raise. To quote Clarke again: this aspect is "one by-product of rockets that some politicians may consider infinitely more terrifying than the ICBM with a nuclear warhead."

How close is this to being a reality? To repeat: technologically we are there. But legally, socially and politically we are light years away. And worse, we are in imminent danger of losing all of the dream forever even though we, the citizens of the United States, have made it all possible with our taxes. Some 80 billion dollars of our money have gone into the space program. True, this has also paid for putting men on the moon and shovels on Mars, but a large per cent of the 80 billion has gone to perfect the powerful rockets and the ever stronger transmission capabilities of the communications satellites. And, if again history is to be any guide, we are in the process of seeing our investment given away so that, with any luck at all, we can pay higher telephone bills, have less postal service for a higher cost, be spoon-fed our TV programs and pay out still more in taxes to subsidize even more communications satellites from which we will obtain only the most minimal of benefits.

As our politicians so often say and so seldom do, let us look at the record. At the end of World War II the U. S. Army "granted asylum" to the German technicians who had developed the V-2. It also "liberated" some 300 railroad box cars filled with rocket components. Until 1958 all of our space program was subject to the on-again-off-again, sometimes bumbling mercies of the Department of Defense which, at various times, decided that no rocket could ever be equipped with a nuclear warhead and that the Russians could never build a rocket that would get off the ground. The development, in 1952, of the comparatively light hydrogen bomb caused the DOD to rethink its position on the importance of rockets and space; Sputnik led to the creation of the National Aeronautics and Space Administration. Nevertheless, it is estimated that about seven out of every eight satellites ever launched by the United States are private Pentagon property. The public has no idea what many of them are for; certainly no idea of what they do and, in some cases, it will probably never know how they do it. Obviously, seven-eighths of our investment in satellites is not intended to be used to accommodate civilian communication needs.

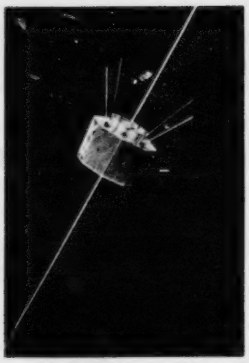
What then of the other one-eighth? Keep in mind that one of the rationalizations for the high cost of the space program was that it would produce "public dividends." So far it has given us advances in such things as teflon, Tang and ballpoint pens that write upside down, all sold by corporations that charge customers for these products which were made possible by research done at the customer's (the taxpayer's) expense. And communications satellites are going the way of Tang.

Comsat and Intelsat

In 1962 there were many strong voices in Congress demanding that the space communications program be kept in the hands of the federal government which, based on the success of Telstar, could have begun to build a satellite system to service both the country's domestic and its then fast growing international needs. Stronger voices from the private sector prevailed and a rather lopsided compromise produced the Communications Satellite Corporation (COMSAT), 50 per cent of which was owned jointly by AT&T, ITT, RCA and Western Union. The other 50 per cent was sold to the public. The President (with the advice and consent of the Senate) could appoint three of 15 members on the board of directors. It was mandated to develop international satellite communications only, thus giving new longevity projections to AT&T's expensive domestic long-lines.

By 1964 COMSAT had organized the International Telecommunications Satellite Consortium, or INTELSAT, an international telecommunications satellite network which has now grown to encompass 91 nations, launched five generations of satellites, and overseen the construction of more than 90 earth stations in 65 countries around the world. INTELSAT leases its facilities to the telecommunication authority of the member nations. In the case of the United States, this is COMSAT representing AT&T, ITT, RCA and Western Union International. INTELSAT charges COMSAT which, being by definition a profit-seeking corporation, marks up the figure it charges, say, AT&T. AT&T, in turn, marks up the figure it charges, say, the New York Telephone Company which marks up the figure it charges, say, you. Your voice may go directly to London but your charges follow no such straight a line.

Interestingly, the anticapitalist Soviets put together their international iron curtain satellite network, INTERSPUTNIK, to be a carbon copy of INTELSAT, profits and all. However, there are two nonprofit



Above, an artist's conception of OSCAR-7, launched by the Radio Amateur Satellite Corporation in 1974. Below, a typical ham satellite ground station.

satellite networks. OSCAR (Orbiting Satellites Carrying Amateur Radio) operationally pre-dates INTELSAT and has used seven small satellites which serve "ham" operators on both sides of the iron curtain. While its satellites are low powered, its earth stations have been put together for about $1,000 each. The satellites cost only about $100,000 each, being voice only and put into orbit for free by being hitchhiked upon large military and NASA launchings.

Using a tired old satellite no one much wanted anymore, a truly public service network serves the South Pacific from Hawaii south to the Cook Islands and west to New Guinea. The Pan-Pacific Education and Communication Experiment by Satellite (PEACESAT) serves universities across that area in exchanging news, agricultural and medical information, etc. via telephone, facsimile, data and radio communications. Students and faculty members have built the ground stations at costs ranging from $1,000 to $25,000 each out of off-the-shelf components. This network cannot be said to have replaced anything, the distances involved being so great that only a satellite alone could make it viable.

But it is INTELSAT that predominates in the world of satellites. INTERSPUTNIK serves only nine nations and has only one low power satellite in orbit, though more are planned in the near future when it hopes to add to its membership and become a true competitor to INTELSAT. INTELSAT meanwhile has changed. From being, early on, a creature of COMSAT, it is now heavily influenced by developing nations rather than by the more industrialized ones. This has turned it from engaging in purely international services to leasing channels for domestic uses. Algeria and Brazil, each with distant, sparsely populated regions ripe for development, are building earth stations to shrink their communications problems. Malaysia, with much the same problem as faced the members of PEACESAT, has also set up a domestic service via INTELSAT. Spain and Mexico have an INTELSAT TV exchange program. Latin American, European and Arab regional systems are planned.

Domsats Abroad

So far only Russia, Canada and, just recently, Indonesia, have set up what could be called independent national satellite systems to serve domestic needs. India, for the year ending 1976, had an experimental domestic system using a high-power satellite, the ATS-6, borrowed from NASA. It is hard to be definitive about the results since formal evaluations are still in preparation. It is known, however, that there were multiple problems on the ground, including a lack of electricity to properly serve even the small receivers needed and that, while the system seemed to work well technically, many doubts have been raised about its educational and social value. By an unfortunate coincidence the satellite went into operation over India just after all press functions in India had been put under government control, thus bringing into spotlight the danger of a satellite-to-home or a satellite-to-community system controlled by a single-party state. Of course not many are deluded by the idea that much in the way of varying points of view finds it way through the low powered channels the Russians or the Brazilians transmit, but, somehow, high power and the accidental timing seemed to make more dramatic the dangers from which even the best intentioned democracy might not be immune.

Canada created a quasi-public domestic satellite corporation, TELSAT, in 1969. Although, like COMSAT, it is partially owned by private common carriers, unlike COMSAT, some ownership and control was retained by the government. Launching of its first satellite, ANIK, in 1972, has served to bring communications and TV to even the most remote Canadian oil and mineral rich areas. Then, in January 1976, Canada, along with NASA, began to experiment with a high-power Communications Technology Satellite (CTS) which can handle TV and two-way voice signals to low-cost terminals placed on individual homes and buildings. Experiments will test the social, educational, cultural and economic impacts of this technology as it delivers health care information to remote and rural areas; disseminates TV programs to educational facilities serving all instructional levels, etc. By 1980, the Canadians plan to inaugurate direct-to-home TV to serve some 500,000 homes.

Domsats At Home

It was not until 1974 that the first domestic satellite was launched to serve the United States. Until then the time was filled with squabbling reminiscent of that which had preceded the formation of COMSAT. It began formally in 1965, when the American Broadcasting Company and the Hughes Aircraft Company went to

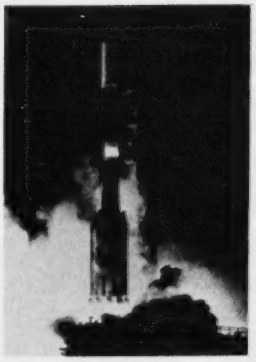
the Federal Communications Commission with a proposal for a satellite to carry ABC programming to its network affiliates. ABC figured that this would save it about 30 per cent of the money it was paying AT&T for rental of its terrestrial long-lines. Hughes, of course, was looking to expand its space hardware business.

The FCC was more than a little puzzled by this. First of all, while it had jurisdiction over broadcasting, what about satellites? COMSAT said it, rather than the FCC, had jurisdiction, despite the fact that Congress had legislatively mentioned only international satellites. By ignoring domestic satellites, COMSAT maintained, Congress had indicated an intent that they should be treated just as were international satellites. Congress, preoccupied with other more pressing problems, kept silent about this. Alternatively, should there be a separate domestic COMSAT? If so, who should participate? Just common carriers? hardware companies? broadcast networks? Should the government keep full control? If so, should it put up its own satellites? or license others to do so? In any case, who should be given access to satellites? Who should control their uses? the content of the transmissions? the ground uses to which the transmissions were put?

All of these questions demanded hard answers, but few would ever be addressed. A national telecommunications commission set up under the Johnson Administration was prepared to recommend, with the FCC's blessing, that COMSAT be permitted to establish an experimental system to test the feasibility of and need for a domestic comsat service. But the Nixon Administration quickly put a halt to any talk of COMSAT extending its international satellite monopoly at home by notifying the FCC that it wanted to review the whole matter before any final decision was made. The Commission, whose leadership had, by then, passed into the hands of Barry Goldwater's 1964 campaign manager and the former chairman of the Republican National Committee, Dean Burch, agreed to wait.

The White House Office of Telecommunications Policy did not exist in 1969 when Dr. Clay T. Whitehead, who would become its first director a year later, was handed the job of designing a national domsat policy by President Nixon. Whitehead, who several years later would become widely known in broadcast circles as Washington's telecommunications "czar" for attacks he would level against the "liberal tendencies" of public broadcasting and the "liberal bias" in network news reporting, called for an "open skies" policy wherein the FCC would allow anyone to put up a satellite and do whatever he wanted with it so long as the applicant could demonstrate possession of the technology and finances to do

the job. The position was that the "public interest" would be best served by a policy of "deregulation," of "free and open competition" in the satellite area. This policy was adopted in 1972 by the FCC which agreed with the White House that the skies belong to everyone.



The rocket depicted here is the type used to launch today's communications satellites.

Few of "us" grabbed at this opportunity to spend tens or hundreds of millions of dollars in order to be the first in our block to own a satellite. Predictably, however, a few large corporations saw this as a means of reaping great profits by serving other large corporations. Western Union was the first to take the plunge with WESTAR in 1974. It now furnishes a choice of full communications to companies that need such things as coast-to-coast private-line telephone service, television transmission, computer interconnections, etc. It also is designed to service other companies, such as the American Satellite Corporation (AMSAT), that have built their own earth terminals and, in turn, service still other companies. City Service Oil Company leases channels to service its own terminals which, in turn, service offshore oil rigs. Western Union has also instituted what it calls "a satellite postal service," mailgram, which has served to make your local letter carrier a substitute for the "boys" on bicycles.

RCA was second up and is concentrating a good deal of its attention on business communications with oil rich Alaska and on interconnecting United States pay-TV cable companies. Then, the American and General Telephone Companies have joined with COMSAT to put up two COMSAT-owned domsats in 1976, with a third planned for 1978. However, just how interested AT&T is in bringing down the cost of a telephone call by the use of satellites has been brought into question by some critics who point to its recent investment in the $196 million TAT-6 trans-Atlantic cable, which can only handle 4,000 simultaneous telephone calls, versus the 28,800 calls that will be handled by the domsat system it was planning and having built at the same time. While even the government has publicly confessed it does not understand AT&T's rate structure, it is known that capital investment plays a big part in determining what you pay per call. Since AT&T sets its prices to achieve a specific rate of return on its capital investment, the more it spends the more it earns — and the more you pay.

Soon satellites will be put into orbit by NASA's space shuttle at a fraction of current costs.

Most recently, in January 1977, the FCC, over the strong protest of the Justice Department, the Federal Trade Commission, AT&T and a host of others, gave the green light to what seems destined to become the most dominant commercial telecommunications force the world has ever known: Satellite Business Systems, a tripartite

venture involving IBM, COMSAT, and Aetna Life Insurance. If the Commission's 1972 domsat policy had been designed for the primary purpose of injecting competition against Bell in the long-haul communications business, its approval of the SBS system promises to do the trick. Not since the early days of radio when, in 1919, General Electric, Westinghouse and AT&T (with assistance supplied by the U.S. Navy) came together to form the Radio Corporation of America, has such a powerful set of actors been involved with the organization of a single corporate enterprise.

And its plans are just as impressive. Unlike the other domsat companies, whose satellites are low power transmitting devices operating in frequency bands that must be shared with other terrestrial services, SBS intends to launch a higher power satellite in 1979 that will function in new frequencies assigned for satellite use only. This means that, instead of having to locate ground terminals outside of urban areas from which cable or microwave links must be constructed to carry signals to the ultimate user, SBS will be able to place satellite earth stations on its customers' very premises. Whose premises? The SBS plan calls for construction of a system designed to meet the expanding data transmission needs of the "Fortune 500," firms that can afford to use the $400,000 ground terminals the company intends to build.

If all of the above portends little or no "public dividend," there have been a couple of gestures aimed toward the taxpayers. One was the launching by NASA, in 1974, of its sixth Application Technology Satellite, the ATS-6. (ATS-1 is the one being used by PEACESAT.) Outside of Canada's CTS, this is the most complex and powerful satellite ever launched (to our knowledge, not being privy to Pentagon activities). NASA spent some $200 million on the hardware and the Department of Health, Education and Welfare put up some $10 million to pay medical and educational institutions to program an experimental network that serviced some 119 ground stations in such places as Appalachia, the Rockies and Alaska. There, one-way color TV and two-way radio consultations with medical experts in Fairbanks and Anchorage were held with paramedics in remote settlements which never before had more than the most rudimentary of health care.

Ultimately, some public broadcasters, together with some large educational and medical institutions, with the help of a $475,000 grant from HEW and NASA, created the Public Service Satellite Consortium. Some members of the PSSC carried out further experimental programming until the ATS-6 went off in 1975, as long promised, to serve India's year-long experiment. While some of what

was said about India's ground difficulties (which grew out of planning problems in the area of educational broadcasting) must also be said of the United States experiments, the technological results were above expectations. With the return of the ATS-6 to the United States, NASA has inaugurated a number of new experiments using not only it and the CTS, but also ATS-1 and ATS-3, to explore new uses to which this advanced technology can be put.

The other "public dividend" advance came with an agreement between Western Union and the Corporation for Public Broadcasting to establish a satellite interconnection system for public television. Ever since the passage of the Public Broadcasting Act of 1967, which established the CPB to spearhead concommercial television in the United States, the need for a flexible, multipurpose and low-cost means to interconnect local stations had been widely acknowledged as quintessential to the emergence of a viable "Fourth Network." The possiblity of going via satellite had figured prominently in much of the early discussion and was most strongly advocated by the Ford Foundation which, in 1966, proposed the creation of a Broadcasters' Non-Profit Satellite System to link the stations of the emerging network. But satellites were not then being seriously contemplated for domestic use, and the Ford plan helped to touch off the FCC's seven-year inquiry into the subject. Now, a decade later, the Ford Foundation's early satellite dream is about to become a reality. The CPB intends to lease three full time channels and a part time use of a fourth on Western Union's WESTAR to interconnect its 264 television stations. It plans also to build 155 of its own earth stations (five receive-and-send, the rest receive-only). Since it will not need the use of these terminals full time, it plans to turn these faciltities over to Western Union on a part time basis in exchange for reduced lease rates on the WESTAR channels. While the initial investment of $40 million is a heavy one for CPB, it feels the savings on the long-line charges it is now making to AT&T will more than pay off. The plan was approved by the FCC in February 1977.

Worthy as these two projects are, they nevertheless represent a "public dividend" to only rather limited, specialized groups: *i.e.*, the "fourth network" and large medical and educational institutions with budgets and access to funding unavailable to most public groups. Moreover, even this "public dividend" is miniscule in comparison to the billion dollar a year dividend which is envisioned for those in the private sector who will be in the domestic communications satellite business in the 1980's. Few voices have yet been raised to question this. It was not a campaign issue. Certainly the media that expect to profit from the new technology

THE WORLD SCENE

I. INTERNATIONAL SATELLITE SYSTEMS	TECHNOLOGY	DATE OF SERVICE
•INTELSAT	13 low-power satellites; 92 earth stations (at $1/2 5M/per station)	June, 1965
•INTERSPUTNIK	1 low-power satellite (4 others planned); 9 earth stations (one in each member nation)	April, 1974
•LATIN AMERICAN PROGRAM EXCHANGE	INTELSAT; 2 earth stations	February, 1974
•OSCAR	6 elliptical orbit satellites; 1 near synchronous satellite	December, 1961
•PEACESAT	1 low-power satellite; 11 audio-only earth terminals (at $500/per terminal)	April, 1971
II. FOREIGN DOMESTIC SYSTEMS		
•ALGERIA	INTELSAT; 14 earth stations	February, 1975
•BRAZIL	INTELSAT; 2 earth stations built, with others planned	June, 1975
•CANADA	2 low-power satellites; 48 earth stations	December, 1973
•INDONESIA	1 low-power satellite; 50 earth stations planned	August, 1996
•MALAYSIA	INTELSAT; 2 earth stations	July, 1975
•USSR	2 low-power satellites; 25 earth stations	April, 1965
OTHER DOMESTIC SATELLITE SYSTEMS ARE PLANNED FOR THE ARAB STATES, CHILE, THE PHILIPPINES, NORWAY, NIGERIA, AND ZAIRE.		
III. EXPERIMENTAL SATELLITES		
•ATS-6 (Applications Technology/Satellite)	High power; small (10 meters), inexpensive ($10-15,000) earth stations	July, 1974
•CTS (Communication Technology Satellite)	High power; small (3 meters), inexpensive ($2-5,000) earth stations	January, 1976
•ECS (Experimental Communications Satellite)	High power; inexpensive home receivers ($500-2,500)	Planned, 1978
•SYMPHONIE A & B	Two medium power satellites; relatively small (9-16 meters) earth stations	(A) Dec., 1974 (B) August, 1975

THE HOME MARKET

Satellites

	Launched	Planned
WESTERN UNION	2	
RCA GLOBCOM/ALASCOM	2	1
AT&T/GTE/COMSAT	1	2
SATELLITE BUSINESS SYSTEMS[1]		2
AMERICAN SATELLITE CORPORATION[2]	(Leased satellite channels from W.U.)	
CORP. FOR PUBLIC BROADCASTING	(Plans lease of satellite circuit from W.U.)	
HOME BOX OFFICE[4]	(Leased satellite channels from RCA)	
CITY SERVICE OIL COMPANY	(Leased satellite channels from W.U.)	
DOW JONES	(Leased satellite channels from AMSAT)	
GENERAL ELECTRIC	(Leased satellite channels from W.U.)	
PHOENIX SATELLITE CORPORATION[5]	(Application still pending at FCC)	
Totals	5	5

1. Joint venture of COMSAT, IBM, and the Aetna Insurance Company
2. Joint venture of Fairchild Industries and Western Union International
3. Seven of AMSAT's earth stations have been built to serve the Pentagon's Defense Communications Agency and Advanced Research Projects Agency
4. Subsidiary of Time/Life, Inc.
5. Joint venture of ABC, CBS, and NBC

DESCRIPTION	Earth Stations Built	Earth Stations Planned	Est. Total Investment Costs	Service
91-nation member, commercial satellite organization established in 1964 by U.S. COMSAT.	5	2	$100M	Common Carrier
9-nation member satellite organization serving communist states (Bulgaria, Czechoslavakia, Germany-DR, Mongolia, Poland, Rumania, Cuba, USSR).	6	150	175M	Common Carrier
Tv program exchange between Spain and Mexico using leased INTELSAT channels.	7		225M	Common Carrier (Telephone only)
International system maintained and operated by amateur "ham" radio organizations around the world (for "hams" only)		50	250M	Common Carrier
Consortium of 11 universities in South Pacific using an experimental NASA satellite (ATS-1) to exchange education and news via radio.	12[3]		20M	Common Carrier
Leased INTELSAT channels to transmit telephone, telex, data, radio and tv.		155	40M	Network Interconnection
Leased INTELSAT channels to transmit telecommunications (inc. tv) to Amazon and other regions of West Brazil.	92	40	7.5M	Pay Cable Distribution
First non-communist nation to launch domestic system for national telecommunications, including service to oil and mineral interests in Northern Territories.	2		.4M	Communication to Offshore Oil Rigs
First developing nation to launch satellite for military and business communications.	2			Newspaper Reproduction
Leasing INTELSAT channel capacity to distribute tv programs from West (Kual Lumpur) to East (Sabah State) Malaysia.	2		.6M	Intra-Company Communications
First nation to establish full-scale domestic satellite system to extend outreach of central government to Siberia and Outer Mongolia.			N.A.	Network Interconnection
Last in series of NASA experimental satellites (begun in 1966 with ATS-1) to test delivery of education and other tv programming to remote regions of U.S. (1974/75; 1976/78) and India (1975/76).	128	396	$818M	
Joint Canadian/NASA experimental satellite to transmit color tv and other, at upper regions of the radio spectrum (12-14Ghz), to remote regions. Education, health, social service and business experiments are planned.				
Japanese-built satellite to test direct satellite to home tv at 12-14 Ghz, using specially made (NHK) tv receivers, to reach remote mountain villages and islands.				
Joint French/German satellite project to transmit tv news, education, and data from Europe to Africa and other developing regions.				

have mounted no editorial crusades on the subject. (The three commercial networks are pulling together a joint satellite project and, as noted, the *Wall Street Journal* is already printing simultaneous regional editions via satellite.) As for the public, most find the subject too complex and mysterious to even think about. A perhaps not completely unintentionally created vacuum seems to have encompassed the entire affair.

However, on an almost hand to mouth basis, a grass-roots movement has begun to fill a bit of that vacuum as some people begin to realize that: (1) the communications satellite is a technology which would not be possible without the initial and continuing investment of their tax dollars; (2) while the technology can be understood and controlled by only a small number of scientists and technicians, the basic issues in question are political and economic in nature and, therefore, in a democracy, must finally be decided by the voters; and (3) the time is fast running out if any reevaluation of our policy (or lack of policy) is to be effective. Unless action is soon in coming, satellite communications, like Topsy, and the broadcast industry, will just grow with no real consideration given to the public "interest, convenience and necessity."

PISA

At the core of this grass-roots movement is the Public Interest Satellite Association, PISA, formed in the Fall of 1975 to spearhead a broadbased public interest effort in the comsat field. It has as its most immediate concern help for those nonprofit organizations most in need of the benefits of satellite technology but least able to present their cases either because of a lack of technical knowledge, weakness in political clout, insufficient funds or a combination of any of these factors. Its Board of Advisors is made up of people with a variety of ethnic, racial and geographic backgrounds representing a broad range of national and international nonprofit organizations with many of its members possessing expertise in the legal, technical or public policy areas of communications. (See listing presented on inside front cover.) The founders and co-directors of PISA are Bert Cowlan and Andrew Horowitz, both of whom became interested in satellites through their realization of the effect the new technology would have on the subject of their primary interest: communications.

Background

Cowlan is a consultant in education, communications and technology, whose clients over the years have included, among others, the United Nations, UNESCO, various U.S. government agencies, foreign governments, and a number of corporate and nonprofit concerns. Horowitz, who served in the Teacher Corps following his graduation from Stanford University in 1968, had been a mainstay at The Network Project, a New York based nonprofit research-and-action media organization, from 1972 until its folding in 1975. There his responsibilities encompassed the areas of national communications policy, the foreign expansion of U.S. television and the use of electronic technologies in education. And he headed up The Network Project's satellite program.

A Case for the Public Dividend

In 1972, as the White House was inserting its hand into the issue, the FCC held two days of hearings on the domsat question. Some 27 parties presented testimony; The Network Project was the only one of these that was neither a government agency nor a major corporation. It spoke out against turning satellites over to private industry and requested that the FCC "hold a rule-making proceeding to determine how the public can have a decision making role in the domestic satellite system." Obviously, the Project was not one of the most influential voices at the hearing, but it did make one point. It had been heard at all only because it had been the single party to point out that, by law, an environmental impact study would have to

be made before domestic satellite systems could be built. Here the Project won a Pyrrhic victory in that now it is recognized such impact studies do have to be made.

Shortly after the FCC announced its acceptance of the White House "open skies" policy, it began handing out construction permits. The Project, in what turned out to be an exercise in futility, filed objections to each of these. It then turned to the only other channel it had open for protest: the courts. There its voluntary lawyers charged that the FCC was not doing the job required of it by Congress.

That general charge was broken into three legal thrusts. One concerned the antitrust laws. How, asked The Network Project, could the FCC award joint permits for satellites to companies which should be considered to be in competition? It was pointed out that there was no evidence that the FCC had even bothered to clear this question with the Department of Justice before granting the permits. On this point, as it did on the other two, the District of Columbia Court of Appeals indicated that it would not interfere with a discretionary agency such as the FCC.

Two other points were based on the First Amendment of the United States Constitution and on the Communications Act of 1934 which said that the FCC must act in regard to radio in the public's "interest, convenience and necessity." The Project pointed out that "radio" had been expanded in its meaning to include television and cable TV, and maintained that this expansion should also cover both domestic communications satellites and earth stations. If this definition were adhered to then it was not sufficient, the Project's lawyers argued, for the FCC to grant permits only on the basis that the grantees were "legally, technically, financially and otherwise qualified." As with applications for radio (and, of course, TV) station licenses, the public's rights should, by law, be taken into consideration. An applicant for a station license or renewal "must ascertain the needs, interests and problems of the community which its radio station serves. . . . Yet, the Commission did not predicate its (satellite) grants on any such data." The Project also pointed out that a radio station must broadcast "programs of local interest and importance and . . . of self expression." Why should this not apply, also, to satellites and their owners?

The Project made the point that, in considering satellites, the community was not just one city or a limited geographical area, but rather the entire United States made up of "communities of interest," including "discrete ethnic, professional, occupational and behavioral communities." The FCC, it charged, had at no time asked the

satellite applicants how they intended to serve the community as a whole or service the needs of "discrete communities."

The further point was made that the FCC would not allow all the radio stations in one area to be owned by one person, company or conglomerate, yet here it was letting the largest corporations in the various phases of telecommunications to act in concert in such a manner that they could monopolize what would be the shape of communications perhaps for all time to come. Outside of some vague expressions indicating good intentions to be acted on at some unspecified future time, none of the companies involved was in anyway required to show how access to the new technology (and thus access to all the communications it served) could be gained by the very taxpayers who had financed that technology into existence. The Project concluded that no permits should be granted until the FCC subjected satellite applicants to at least the same type of tests it gave to a radio station application.

Demands for Public Access

After the court found in favor of the FCC, the Commission, as we have seen, began granting permits. Satellites are flying; ground stations are being built; more of each are on the way. Outside of the early actions taken by The Network Project, there has been little public clamor about satellites and their uses. Nevertheless, these are troubled times for the FCC. There has been much public unrest shown concerning communications in general, beginning as long ago as 1966 when then Circuit Judge Warren Burger ruled that representatives of the public had the right to intervene in FCC licensing proceedings. Slowly at first, now at an increasingly more rapid pace, citizen groups have intervened in station license actions. While few licenses have been denied, the industry has become so nervous it is asking for legislation which will protect it from "consumers."

Public access channels have been forced on the cable TV industry and people are beginning to use them. Organizations are spending time and money learning how to become most effective in putting across their ideas. Ironically, many of these ideas have to do with the quality of the products being brought forth by the telecommunications industry itself. While this type of action has brought little, if any, real reform, at least lip service is being given to concerns about children's programs and TV violence.

Over and beyond the direct actions being taken by both individuals and private nonprofit organizations to influence the telecommunications industry, there has developed what might be called a "communications implosion." As yet little studied, no one seems to

have much understanding of the sudden emergence on the scene of Citizens Band Radio. The facilities for it have been around for some time. Why then, overnight almost, has it become so popular that retail equipment stores keep running out of stock? that CB channels have been expanded from 23 to 40? and that no census of CBers is even remotely possible?

Since the days of smoke signals, this is the first form of communication at a distance that has not been conceived and promoted from the top down. When radio stations first went on the air to sell receiving equipment, people were so entranced at being able to hear KDKA halfway across the country that the industry experienced an explosive success. TV, delayed by the war, was sold to the public at great cost and another explosion came. With CB, the customers, the users, the people have initiated the growth from the bottom up. Manufacturers who had eliminated CB from their product lines because it had for so long been profitless were taken by surprise.

There have been some guesses about this, but that is all they are, the phenomenon is too new. But one guess that cannot be ignored is that it might be part of a revolt against telecommunications as they are now set up. Radio stations are finding that they are losing their most valuable asset because drivers would rather use their CBs than listen to radio during "drive time." Could it be that people would rather talk *with* than be talked *at*? This hypothesis might very well fit into the other signs of the public's growing unrest with the telecommunications *status quo* and be yet another signal that there is a growing demand for a change.

In different ways, Cowlan and Horowitz had been both observers of, and participants in, the public action movements in the telecommuncations field. And both felt that some means was needed to focus the disparate energies that were simultaneously flowing from so many sources; that some cement was needed to bind together those who felt, in so many ways, discontent with the uncontrolled monster, telecommunications. After The Network Project's failure in court, Horowitz was convinced the solution would have to be found in the political area, not the legal. Moreover, the time was ripe since not only was there the beginnings of the popular swell, but there was also a new technology that could not be ignored: communications satellites. Even if no one but the FCC, the corporations involved, a few public broadcasters and some large educational institutions, and Congress ever heard of satellites, new laws were needed and would come. How much better, he reasoned, it would be to have the public add its input and, at the same time, demand that the satellites involved be only one factor in an entire telecommunications reevaluation.

Cowlan agreed yet both were aware of the difficulties of trying to sell this kind of an idea when so few people knew any more about satellites than that they furnished the TV audience the questionable pleasure of seeing Presidents live in China. Satellite education was a prime need and the public sector most ready for that education seemed to be the private nonprofit, public interest organizations which could most immediately gain from the benefits promised by satellite technology. Hence, the forming of the *Public Interest* Satellite Association.

PISA: To Date

In the time it has been in operation, working under the tax-exempt auspices of the Institute of Public Administration, PISA has received support from a number of socially conscious private foundations. It felt that its first step was, of necessity, to prove that it, indeed, had a constituency to represent. So it both began a major effort to let nonprofit organizations know of PISA's existence and commissioned a survey of the communications needs of the nonprofit sector. The results in both areas were surprising.

User Needs Survey

From all available evidence, the survey commissioned by PISA and conducted by Melvin A. Goldberg, Inc./Communications was the most comprehensive ever undertaken to explore the techniques currently being used by organizations in the nonprofit sector to meet their communications needs. It covered the expenditures on radio, TV, data transmission, long distance telephone and national and regional conferences of the 897 nonprofit organizations in the United States with 10,000 or more members. Those organizations which replied to the questionnaire spent, on average, some $160,000 per year each. Projected this would mean an annual expenditure for communications of $143,632,340 by only the 897 largest private nonprofit organizations. There are, in the United States, some six million nonprofit organizations of which roughly half have more than one chapter. This is a multibillion dollar communications market.

In early June of 1976, these findings were rushed to the FCC, which was then in the process of setting policy in preparation for the World Administrative Radio Conferences (WARCs) scheduled to take place in Geneva in 1977 and 1979. The WARCs, which operate under the auspices of the International Telecommunications Union (the international body that regulates telecommunications and the use of the radio spectrum worldwide), would be allocating frequencies for all future satellite communications and broadcasting purposes until the year 2000 — decisions which would take on the force, in law, of an

international treaty. The fact is, in the matter of frequency allocations, satellites today stand where television did before the Second World War. At that time, no voice was heard to speak for the nonprofit community, and we have all had to live with the consequences of that failure ever since. PISA's survey was aimed at assuring that the same mistake would not be made as we now enter upon a new satellite era and that access to channels allocated for future satellite use would not be lost to citizen, minority, consumer, public interest, educational and other nonprofit groups. Moreover, it showed that, indeed, such a constituency exists.

And there is interest. It has been expressed by such diverse groups as the American Automobile Association, the National Association for Women, the United Nations Association of America, the National Education Association, the Sierra Club, the National Police Officers Association of America, and the Consumers Union. Among the first to express interest in PISA's activities was HEW's National Institute of Education, which expects to be allocated some $14-16 million by Congress to support, over the next four years, satellite research and experimentation. It commissioned PISA to submit a paper (one of several designed to provide guidance to future would-be recipients of these funds) on the subject of "Narrow-Band Applications of Satellites for Communications." This was distributed by NIE at a conference it hosted in Washington, D.C. in February 1977.

Narrow-Band Preference

Early on PISA had been concerned not only that the nonprofit and educational sectors be given access to satellite technology but also that those sectors should learn to use the technology for maximum efficiency. While color TV is glamorous, even with the new technology, it is more expensive and often wasteful. For example, the two newest domsats have channels designed to handle 600 two-way conversations simultaneously or one TV program. TV is said to be "broad-band"; voice, "narrow." Also narrow are telex, facsimile, data, radio and slow scan TV, which gives one a pretty broad variety of ground technologies to use at a fraction of the cost of TV, not only because of the narrow-band but because less expensive ground terminals are needed. PISA's NIE paper was aimed at defusing the bias within many educational circles in favor of broad-band techniques, such as the one-way delivery, into schools, of color TV and at pointing out the many uses to which the less expensive narrow-band technologies could be put for both in-class and out-of-class educational needs. It pointed out that, too often in the past, the educator has had to comply with the needs of the technology (as in the need to reschedule classes to meet the time requirements of a TV broadcast controlled by some outside manage-

ment); PISA suggested ways educators could make technology conform to their needs as they saw them for their own particular local setting.

Nonprofit Uses of NASA Satellites

PISA has found that a number of nonprofit organizations have become interested in participating in the NASA experimental satellite program. For would-be experimenters to gain access to an available NASA satellite, they must prepare detailed proposals setting forth how they want to use a satellite and why a satellite is essential to accomplish what is proposed. Not many of these organizations have the technical expertise to plan such experiments in ways that would satisfy NASA, so PISA has developed a program to assist prospective nonprofit experimenters prepare NASA proposals. In October 1976, PISA convened an "experimenters' conference" bringing together various groups from across the country to hear directly from NASA and to provide them an opportunity for their plans to be discussed and tested before formal proposals were written and submitted.

Some of the nonprofit groups with which PISA is working closely in the planning of a NASA experiment include:

- The Association of Community Organizations for Reform Now (ACORN), an organization formed to encourage community organization efforts throughout the South. It has long realized the value of communications as a community organizing tool and would like to use a NASA satellite to help expand its operations both further throughout the South and into Northern states.
- The Community Video Satellite Project, a group of cable television video producers, who would like to experiment with a satellite to share and exchange community-produced video material among local cable systems across the country.
- The Consumers Union which plans to experiment with a satellite to establish a computerized consumer-information retrieval network. It currently maintatins a centralized data bank containing information about auto repairs and would like to provide consumers around the country with low-cost access to this material via satellite.
- The National Association of Neighborhood Health Centers which is planning an experiment which would link, via satellite, urban and rural areas for the training of paramedical personnel, the transmission of patient records, and the education of patients in self-care. NANHC oversees more than 200 Neighborhood Health Centers situated in every state in the nation, including Hawaii and Alaska.
- The Pacifica Foundation and the National Federation of Community Broadcasters have prepared a joint NASA proposal calling for the the establishment of an experimental satellite based FM network. They want to equip each of their member, noncommercial, listener-supported radio stations with a two-way satellite terminal for the exchange of programming, teleconferencing among station

managers, and live satellite feeds.

- The Public Interest Research Groups (PIRGs), a Ralph Nader inspired student financed and managed research-and-action organization currently active in more than 30 states, which would like to experiment with an interactive information exchange and data distribution network.
- The Women's Action Alliance, a coalition of 109 women organizations representing 33,000,000 women, which intends to link a number of feminist centers around the country, via satellite, to experiment with the transmission of information pertinent to the ongoing activities and viability of the women's movement.

Artists, community legal aid organizations, journalists and others are also working with PISA to explore new and unique applications of satellite technology.

One of the most interesting new technologies PISA intends to experiment with in its satellite work is slow-scan television. Using the narrow- or voice-band only, a black and white TV picture can be "built up" on a TV screen so that it can be photographed with a Polaroid for future reference. It can also be transmitted (simultaneously with a voice narration) and recorded on an ordinary audio cassette for playing later, after passing through a small converter, on any TV set. PISA is working with the South Dakota Indian Education Association which is interested in experimenting with a satellite intercommunications system using slow-scan TV and other narrow-band techniques (including CB) to connect Native American reservations with each other and with urban areas for educational purposes and as a means of communicating by both word and picture with Native Americans who have moved to urban areas from reservations.

Access To Operational Systems

NASA experiments allow groups to acquire experience with the latest in satellite technology and provide an opportunity to explore a wide range of applications that could be transferred to an operational system at a future date. Given the major technical breakthroughs rapidly taking place that promise to greatly reduce satellite costs by the end of the decade, it was recognized early on that an important part of PISA's overall task would be to help plan a smooth transition from the experimental to an operation phase. As a first step in this direction, PISA approached the Corporation for Public Broadcasting in the summer of 1976 concerning its planned use of WESTAR with a suggestion that some of the uncommitted time of the various ground stations be used to service the needs of other nonprofit organizations.

PISA's interest in exploring the nonprofit sharing matter with CPB was based, in part, on its then recently completed user-needs

survey, which had identified a substantial nonprofit "market" eager to develop low-cost alternatives to meet its growing long-distance communications needs. It also was founded on the knowledge that public television's proposed satellite interconnection would be financed with taxpayer funds and that, for this reason alone, the Corporation had a responsibility to see that its system would be used to serve the largest possible public benefit. Hence, in late July, PISA wrote CPB President Henry Loomis setting forth its concerns and requesting that the Corporation establish a National Citizens Task Force to determine how and on what basis public television's proposed satellite system could be shared with other nonprofit groups. Over the course of the next several weeks, and aided by the support of other public groups, it entered into a series of discussions with CPB's legal counsel and its Director of Satellite Operations. Despite the Corporation's desire to concentrate its full energies upon a satellite system designed, first and foremost, to serve the broadcast interests of its member stations, PISA argued that the sharing arrangement it was proposing spoke directly to a long-recognized need: to attract public support and encourage increased citizen involvement in the affairs of public broadcasting.

On September 10, Mr. Loomis responded to PISA by letter that the CPB would, upon FCC approval of its lead applications, ". . . convene a meeting of representatives of potential nonprofit users of the satellite interconnection; and thereafter, under appropriate circumstances, to participate in a study of the potential usefulness to various nonprofit users of the public broadcasting ground environment." Several days later, ACNO — the Advisory Council of National Organizations to the CPB — endorsed Mr. Loomis' commitment to PISA, and informed the Corporation's Board of Directors that it wanted to oversee the study that eventually would be undertaken. Now that the FCC has approved the CPB satellite plan, negotiations toward this end have begun involving the Corporation, ACNO, PISA and a number of other interested parties.

Those, then, are some of PISA's accomplishments in the few months it has been in existence. Another has been to stay alive. Funding a new organization in a field as little understood and novel as satellite communications has been a slow and painful job. And a continuing one. However, there is much more to be done.

The Future

Soon, some decision must be made concerning PISA's organizational structure. It hopes to incorporate on a nonprofit, tax-exempt basis, but much consideration must still be given to how it can best serve both its constituency and the public at large in what bode to be

both exciting and trying times to come. How can it best carry out the commitments it has already made to aid in NASA presentations and to help secure grants for would-be nonprofit ATS and CTS experimenters? How can it best continue the setting up of liaisons with the members of the nonprofit community it is designed to serve? How can it best build on the solid basic research it has begun?

While PISA would like (indeed, at the proper time, feels it is essential) to address its services to the full voting public that will be vitally affected, literally, for centuries to come by what is now going on in the satellite field, it believes the nonprofit community is a good "first step" for an organization with limited resources. Its most immediate priority, then, is to educate the educators, the community leaders, the social service organizations and the other members of the nation's nonprofit sector about the benefits and stakes they stand to lose should they not begin almost immediate action. This calls for the constant contacting of organizations in the nonprofit field, constant and continuing research into their communications requirements, and the constant contacting of satellite engineers, lessors, and vendors to keep current with what will best satisfy the discovered needs. There seems to be a need for a satellite journal to periodically update those with a need-to-know of the fast changing technical, economic, social and political developments in the field. The House Communications Subcommittee's intention to embark upon a historic rewriting of the Communications Act makes the need for an intelligent and indepth discussion of satellite and related telecommunications issues a most important and timely one. Soon, PISA hopes to introduce its own publication, *The Public Dividend,* to be issued on a quarterly or perhaps monthly basis.

Policy Questions

All of this implies a constant monitoring of actions in Congress, in the courts, in the FCC, in HEW and other government agencies, in the United Nations and throughout the world. Policy questions are going to have to be answered soon; almost overnight some of these decisions could be set in stone. Among the many upcoming and consequential matters to be decided, none stands out more than what should be NASA's future role in the communications satellite arena. At the moment, this question is undergoing top level review within the agency; its resolution is certain to have a lasting effect upon all who continue to dream about the introduction of a powerful satellite engineered to provide low-cost communications services to the public and to nonprofit groups.

The issue centers around the question of what will happen when NASA's current fleet of experimental satellites dies; the agency

presently has no authorization to build and launch new and more advanced spacecraft for communications purposes once this impending fate strikes. The problem stems from a White House decision made in 1973, following the FCC's "open skies" domsat policy, to remove NASA from the communications area on the theory that the private sector would be able to shepherd future developments in the field. Up to now, however, the theory has not held up as the industry has chosen to concentrate its efforts primarily on serving the needs of large business users located in major markets rather than focusing attention on the development of high power satellites that could be used in conjunction with small and inexpensive ground terminals to service those in out of the way rural and poor urban regions of the country. Meanwhile, the Canadians, the Japanese, and a consortium of European states have commenced upon an intense campaign to pioneer more advanced hardware and to supplant America's leadership position in the new technology, a most alarming prospect to those who are fearful of seeing a multi-billion dollar market dumped into the laps of other nations. Outside the Hughes Aircraft Company, which is trying to sell the idea of launching upon NASA's space shuttle a high power satellite it wants to build and own (SYNCOM IV), no commercial entity has come forth with plans to advance the state of the art in any substantial way and none seem eager to plunge ahead into a field absent any guaranteed profit-making potential. Unintentionally, a large void has been created.

For nonprofit and other small users concerned about preserving their stake in outer space, the main (and perhaps only) hope for filling the present vacuum lies in getting NASA back into the business. There still remains much experimentation to be done before the many and varied social uses of satellite technology can be fully explored, refined and even totally understood. New and better hardware, designed on the basis of the knowledge already gained from what little experimentation has gone on, must be engineered and tested. Moreover, word of satellites has only begun to get out to those who could most benefit from what the technology has to offer — to those who have not yet had an opportunity to experiment with it in new settings and in ways that have not been attempted to date. Fortunately NASA is aware of the problem, and there are those within the agency who are trying to do something about it. At the moment, a small group of engineers working out of the Goddard Space Flight Center in Greenbelt, Md., are preparing a preliminary design of a new "Public Service Communications Satellite," which, if it gets Headquarters' approval and Congressional funding, could provide extremely low-cost experimental communications services

by the early 1980's. But given the opposition expected to surface from certain quarters to fight it, it seems questionable that the new bird will ever fly unless the public's voice is heard. An important aspect of PISA's work in the months ahead will be to make sure it is.

At the same time, attention also will have to be given to a host of other pressing satellite policy questions relevant to the needs and interests of the nonprofit community. Some of the more obvious of these are:

- Under what conditions should nonprofit organizations be permitted to use commercial domsats? At the moment, there is no national policy concerning what right of access should apply to nonprofit groups which may wish to use existing and proposed commercial satellite systems. As is the case with postal rates, and IRS regulations, should the FCC be required to establish special, reduced bulk rates for the nonprofit community?
- Should there be a nonprofit satellite communications system tailored specifically to meet the needs and requirements of the nonprofit sector? Should NASA's plans for a new "Public Service Communications Satellite" materialize, might it not, at some future date, become the property of the nonprofit community? If so, what kinds of communications services should such a satellite provide? To whom and under what conditions? Who should pay for it? How and by whom should it be managed?
- Just as CPB's planned satellite system opens up a large number of sharing possibilities for other nonprofit groups, the same may be true of the cable television industry's entry into the satellite world to receive pay-TV programming. Since cable entrepreneurs are already required by the FCC to maintain "public access" channels on their systems for free public use, should they not also be required by the Commission, in order to give some concrete meaning to the "public dividend" concept, to offer nonprofit groups free or reduced rate access to their ground stations? Moreover, should not all satellite companies, like broadcasters, be required to put aside some of their facilities for free public service use on the theory that the skies, like the airwaves, "belong to everyone"?
- And, speaking of public television's proposed satellite system being shared with other nonprofit groups, how should this best be accomplished? What kind of institutional mechanism will have to be created to manage such a system? Who should be permitted to participate in it, and on what terms? And, perhaps most important, on what basis should access to it be made available?

Access, no matter how the above are decided, is going to be a troubling question for a very long time to come. This includes not only who is going to have access to what on what basis and for how much but what access will be given to the new technology that is both here now and is yet to come. Recall that, with the space shuttle, launching a small satellite will be of negligible cost. Many such could be launched for free as are the OSCARS used by the hams. As

the amateur radio community has effectively demonstrated, small, narrow-band satellites are not all that complicated to build with off-the-shelf components. Indeed, they can be built in basements and warehouses. PISA has already discussed the possibilities of commissioning the building of such a satellite which could be used by a wide range of nonprofit organizations as well as nonprofit community and university broadcasters to both exchange programs and eventually broadcast directly to any home with a small satellite receiver. It can be done.

But will such satellites be allowed? Broadcasters, for one, would not be that happy to see such technology used as it obviously would make the inexpensive creation of other networks a certainty, thus diluting their flow of advertising dollars. Local stations could face a time when they were no longer needed. ABC, with the support of the other networks, has gone on record at the FCC against the introduction of small earth station satellite technology and network affiliated stations have served notice that they intend to release a "White Paper" to Congress detailing the "disastrous consequences" of high-power satellite technology. The war against what has been called "the lifeblood of the free marketplace," competition, is well under way. Some battles have already been lost; some are being fought in Congress at this very moment.

Whence the "Public Dividend"?

Basic to these battles is the definition of the phrase "public dividend." To many in both business and government, taxpayers get a public dividend merely because, at their expense, a new product or technology is in existence and is there for the using by those who can pay for the privilege. This has long been the philosophy of those who have allowed drug companies to exploit the products of publicly financed research and development. Many in Congress, in government agencies and in corporations feel the same about space. Perhaps, in a free enterprise system, there is validity to this argument but there are many shadings of disagreement with it.

First, there are those who contend that the government should not be a giant welfare agency for big business. This was the argument made by Senators Kefauver, Douglas, Gore and Morse in the early sixties when they called COMSAT the "biggest giveaway in history." Then, there are those who feel that, in a capitalist system, the profit motivation of private entrepreneurs will serve the new product or technology only if certain precautionary measures are taken to insure fair competition so that the taxpayer-customer does get benefits, be those benefits lower prices, better products, improved service or, preferably, all three. Neither of these two points of view can be much

satisfied with what is now being suggested.

There is already in Congress what is popularly called the "Bell Bill," a piece of proposed legislation that would make into the law of the land such provisions as:

1. The outlawing of all "wasteful duplication" by common carriers; *i.e.* all competition;
2. Allowing AT&T to acquire any companies put out of business by the first provision;
3. The exemption of AT&T from any antitrust laws;
4. Switching regulation of terminal facilities from federal to state control. (This would allow AT&T to go to state courts seeking to regain the monopoly that was taken from its subsidiary, Western Electric, by the U.S. Supreme Court.)

The misnamed "Consumer Communications Reform Act" would, in effect, put all domsats under AT&T on the theory that competition will result in higher prices to the consumer. Both the domsat and terrestrial microwave carriers have strongly denied that this will occur and have argued that, in any case, the FCC possesses the necessary regulatory tools to assure that it will not. The fact of the matter, however, is no one, including the Commission, really knows; to this day, AT&T's rate-setting practices remain a mystery which no regulator in Washington has been able to solve. The problem is only compounded by the confusion that exists concerning the meaning of competition itself. And here AT&T does have a point.

AT&T's "competitors" have been most selective about the areas in which they have chosen to compete. They are furnishing services only to specialized big users, the "cream" such as "Fortune 500" companies, the rich Alaskan oil market and cable pay-TV companies. This could leave AT&T with little except individual users, including those in rural, sparsely populated "thin trunk" areas. It is quite conceivable, as AT&T claims, that costs to those customers would have to be raised, especially if AT&T is to continue to amortize its huge capital investments.

This seeming impasse offers the public, the nonprofit sector and, indeed, the Congress a magnificent opportunity. Technically, we are living in the satellite age; legislatively, in some ways, we are still living in the age of the crank phone. Business, for instance, pays, on average, rates that are 1.5 times those paid by individual users. Because businesses use much more than 1.5 times the service used by private subscribers, some, including the FCC, see this as AT&T rates favoring business at the expense of the private residential user. One Congressman has accused AT&T of carrying out its own

"income redistribution plan." Actually, no rate structure has ever been geared to user needs for the simple reason that no comprehensive, nonpartisan, public study has been made of what user needs are. With the advent of the new technology, should not all of America's telecommunications be studied from a base with the logical beginning of finding out who needs what and why? Only by fitting those finding to the "state-of-the-art" can a rational regulatory policy be formulated. Otherwise, we could find ourselves putting together the equivalent of a coast-to-coast superhighway system designed for use only by the horse and carriage.

AT&T with its "Bell Bill" and the opposition to it being voiced by its competitors have opened a most legitimate question for debate but more debaters are called for: representatives of nonprofit users, educational users, broadcasters (both commercial and noncommercial), minority groups, small businessmen, inner-city groups, rural groups, senior citizens, the handicapped, hospitals (who might find some solutions to their costly problem of service duplications), and even the growing mass of Citizens Band users who are beginning to think in terms of a CB satellite network patterned on the hams' use of OSCAR.

But time IS of the essence. As we have seen, bills are in Congress; those with vested interests in protecting their investments in traditional technologies are arming their camps; the FCC, having already dispatched of the 1977 WARC, is facing the deadlines of the general WARC meetings in 1979. Then, there is the parking problem. As the late Mr. Goldwyn might have said, space is as big as all outdoors, but even it has its limits. To reach all 50 states, a SYNCOM DOMSAT must be put into a narrow area over the Pacific Ocean west of the Galapagos Islands. Since the signals can become garbled if satellites are clustered too close together, only a certain number can use this "window." To be in this window rather than being even just outside of it is said to be worth, literally, millions of dollars per year. There are now more than 200 applications for approval for commercial satellites and/or earth stations awaiting action by the FCC. If action is not taken soon by the public, led by the nonprofit sector, this is only one of many "windows" that will be closed to us forever.

CFA Satellite Policy Resolution

On February 12, 1977, the Consumer Federation of America, an organization representing more than two hundred consumer groups, labor unions, rural cooperatives and other nonprofit organizations, passed the following resolution concerning the matter of satellite communications:

The communications satellite technology can change the character of existing means of distant communications transmission (e.g., land and sea cables, microwave and radio transmitters), and, along with them, many of the institutional, social, economic and legal patterns and practices that have grown up around them.

Because the technology of satellite communications was made possible largely through public taxation, CFA believes that, as domestic satellite systems develop and as space within the electromagnetic spectrum is allocated for their use, the needs and interests of non-commercial, public interest and educational organizations and of those potential users who cannot afford to construct and operate satellite systems but who could most benefit from what the technology has to offer, must be protected through new legislation and regulatory policies.

Therefore, we recommend that the Federal Communications Commission expand investigations it already has begun to review into the legality of AT&T rate-setting practices by embarking upon a landmark study pointing toward the development of a new approach and philosophy concerning the establishment of communications rates consistent with the satellite era. We urge that the FCC enforce the more efficient and effective means of lowering the cost of communication services so that the greatest benefits will be made available to the consumers.

Further, because of the known and documented need of nonprofit organizations for improved, lower-cost means of long-distance communications, we urge the FCC to establish a special, reduced tariff for nonprofit bulk users of existing and proposed commercial satellite systems. CFA cites the reduced bulk rate mail service that nonprofit organizations presently are entitled to under law as a precedent in this area, and recommends that the FCC begin adjusting satellite common-carrier rates accordingly.

CFA recognizes the key role to be played by the National Aeronautics and Space Administration in pioneering satellite communications research, development and experimentation, and urges that this work be continued and expanded. We support the preliminary planning currently ongoing by NASA for the possible launch of a "Public Service" satellite by the early 1980's, and we urge that it be strongly supported by legislators to encourage the development of a system of telecommunications that is open and available, on an equitable basis, to all Americans.

CFA is aware of plans being formulated by the governments of Canada, Japan and other nations to develop systems of direct satellite-to-home/office communications, and urges that both the FCC and Congress establish a national commission to assess the need for and desirability of such a service for the United States. Such a commission should address questions as: what kinds of services might a direct-to-home/office satellite communications system provide? to whom might these services be made available? on what terms and at what costs? how should such a system be managed and financed?

Recognizing the national interest in energy conservation and environmental protection, CFA urges that the capability of advanced telecommunications to control consumption of scarce resources be acted upon as a new priority in public policies. Careful attention needs to be given as to how the interchange of information — to and among businesses, public and private institutions, and homes — can substitute for movement of goods and persons and render American life more efficient.

CFA is also aware of and strongly supports the plans of the Corporation for Public Broadcasting to establish a satellite system. Since this proposed system is to be paid for with public funds, we strongly urge that the CPB begin immediately to determine how its satellite system can be shared with other nonprofit users to help meet their present and future needs for low-cost long-distance telecommunications services.

GLOSSARY

Communications Satellite

A man-made object carrying electronic equipment capable of receiving and transmitting communications signals to and from earth.

Synchronous Satellite

A satellite positioned 22,300 miles in space where it rotates at the same speed as the earth, thus appearing stationary overhead.

Fixed Satellite

Low to medium power satellite which sends signals to large (30-90 foot dish antennas) and expensive ($100,000-5,000,000) earth stations.

Direct Broadcast Satellite

High power satellite which can transmit signals to extremely small (3-10 foot antennas) and inexpensive ($1,500-10,000) earth stations mounted atop home or office buildings.

Earth Station (Terminal)

Equipment on earth used for reception and/or transmission of signals to and from a satellite.

Transponder

Device on a satellite which receives signals from an earth station, amplifies them, and then retransmits them to earth. Commercial satellites now in use are equipped either with 12 or 24 transponders, each of which can handle one TV signal or about 600 two-way audio signals.

Footprint

The area on earth within which a satellite's signal can be received.

Launch Vehicle

A rocket used to place a satellite in orbit. Soon, satellites will be launched by NASA's space shuttle.

Payload

The equipment placed upon a rocket that is launched into space, i.e., a satellite.

Power Flux Density

The amount of power (measured in Watts) available on a satellite to transmit signals to earth. The more power that can be put on a satellite, the smaller and less expensive can be the receiving and transmitting equipment on the ground.

Frequency

The number of complete cycles of current per second produced by an alternating current generator, usually expressed in hertz. A hertz is one cycle per second; a kilohertz is 1000 cycles per second; megahertz, 1,000,000 cycles per second; gigahertz, 1,000,000,000 cycles per second.

Bandwidth

The capacity of an electronic communications system, measured in frequencies. The radio spectrum assigned to satellites is 500 megahertz wide. The bandwidth required to transmit TV is 4.5 megahertz; stereophonic radio, 15 kilohertz; telephony (including telex, facsimile, data and slow-scan TV), 3 kilohertz.

The Public Interest Satellite Association (PISA) is an organization formed to help the nonprofit public interest, consumer, voluntary and socially active citizen sector of American society obtain the benefits of satellite telecommunications. It informs and mobilizes this vital community so that it can claim its share of the "public dividend" in space.

PISA has conducted studies on how nonprofit organizations use telecommunications today and the costs involved in such use. And it assists these groups to obtain access to and use of existing communications satellites and systems.

PISA's objective is the establishment of a low-cost satellite communications system tailored to serve this nonprofit segment of society. An important aspect of its current work is to assure that public policy options remain open for achievement of this goal.

THE PUBLIC INTEREST SATELLITE ASSOCIATION
55 W. 44th Street
New York, N.Y. 10036
212-730-5172

THE PUBLIC INTEREST SATELLITE ASSOCIATION

Co-Directors

Andrew Horowitz
Bert Cowlan

Board of Advisors

Kate Egowa Beals
Economic Planner
Arctic Slope Regional Council

Mrs. Walter Bishop
Board Member
National Council of Christians and Jews

Warren Braren
Associate Director
Consumers Union

J. Alfred Cannon, M.D.
Chairman, Department of Psychiatry and Human Behavior
Martin Luther King, Jr. General Hospital

Ted Carpenter
Executive Director
National Citizens Committee for Broadcasting

Mrs. Peggy Charren
President
Action for Children's Television

Theodore Conant
Director of the Technology Group
J. Henry Schroder Banking Corporation

Robert Fine
President
Fine Communications Corporation

Edwin A. Goodman
President
Fifty Third Street Ventures, Inc.

Morton Hamburg
Attorney
Sinsheimer, Sinsheimer & Dubin

Marion Hayes Hull
Director of Research
Cablecommunications Resource Center

Catherine Irwin
Board Member
Advisory Council of National Organizations
to the Corporation for Public Broadcasting

Mrs. Lee M. Love
Communications Research

Howard N. Mantel
Director of Government Programs
Institute of Public Administration

Dr. Richard Marsten
Dean, School of Engineering
City University of New York

Brig. Gen. Martin Menter (ret.)
Of Counsel
Haffer and Alterman

Dr. Carroll V. Newsom (ret.)
Former President
New York University

Dr. Lee Salisbury
Professor of Speech, Drama and Radio
University of Alaska

Peter Weiss
Director
Center for Constitutional Rights

Charmaine Wisecarver
Director
South Dakota Indian Education Association